

CLAIMS

THE INVENTION CLAIMED IS:

1. A trench apparatus for liquid treatment of fabric comprising
 - a) a longitudinal trench for holding a treatment liquid;
 - b) a pull rope, chain, or cable having a plurality of shackle rings or shackles attached thereto for securing one or more bags to the rope, chain, or cable, the pull rope, chain, or cable being positioned for pulling one or more bags containing dyed fabric in a longitudinal direction down the length of the trench, the pull rope, chain, or cable engaging a pulley, sheave, or sprocket;
 - c) an untreated fabric platform adjacent one end of the trench and a treated fabric platform adjacent the other end of the trench.
2. A trench apparatus of Claim 1 wherein the trench has a liquid treatment zone with a surface level, and the trench includes one or more raised platforms dividing the trench into a plurality of separated treatment vats, the raised platforms having a height extending above said surface level;
3. A trench apparatus of Claim 2 wherein a conduit communicates from at least one vat to at least one other vat at a level below said surface level for movement of liquid therebetween.
4. A trench apparatus of Claim 2 wherein liquor recirculation within an individual vat is accomplished by means of a pump which takes suction from the upstream end of the individual vat and discharges into the downstream end of the individual vat.
5. A trench apparatus of Claim 2 wherein the raised platforms within the trench permit adequate residence time of the elevated fabric containing bags to facilitate optimal draining of the liquor from the bags.
6. A combination of a trench apparatus of Claim 1 and one or more of said bags containing fabric, wherein the trench has a liquid treatment zone, the bags being dimensioned when full to block liquid flow down the trench.
7. A combination of a trench apparatus of Claim 1 and one or more of said bags containing fabric, wherein the fabric is denim scrap.
8. An apparatus of Claim 1 wherein the treatment liquid is a member selected from the group consisting of dye solvent, aqueous reducing solution and aqueous bleach.

9. An apparatus of Claim 6 wherein the dyed fabric is denim and the treatment solution is a solvent for water-insoluble indigo.

10. An apparatus of Claim 6 wherein the dyed fabric is denim and the treatment solution is an aqueous solution containing a reducing agent for indigo.

11. An apparatus of Claim 6 wherein the dyed fabric is denim and the treatment solution is an aqueous bleach for reducing color of indigo.

12. An apparatus of Claim 11 wherein the aqueous bleach is hydrogen peroxide.

13. An apparatus of Claim 11 wherein the aqueous bleach is an alkali metal hypochlorite.

14. An apparatus of Claim 11 wherein the aqueous bleach is a hydrogen peroxide bleach containing a bleaching catalyst.

15. An apparatus of Claim 14 wherein the bleaching catalyst is water-soluble quaternary amine catalyst.

16. A process for treating fabric with a liquid comprising the steps of
a) moving a bag containing said fabric down a first longitudinal vat containing liquid at a level wherein longitudinal movement of liquid in the vat is blocked by the bag, whereby longitudinal movement of the bag causes liquid to flow through the bag in a direction counter to the movement of the bag;

b) moving the bag from the vat across a drainage platform to allow excess liquid to flow from the bag; and

c) moving said bag containing said fabric down a second longitudinal vat containing liquid at a level wherein longitudinal movement of the bag causes liquid to flow through the bag in a direction counter to the movement of the bag.

17. A process for treating fabric with liquid according to Claim 16 wherein the dyed fabric is denim, and the liquid is a treatment liquid which is a member selected from the group consisting of dye solvent, aqueous reducing solution and aqueous bleach.

18. A process of Claim 17 wherein treatment liquid is passed from the second vat to the first vat in countercurrent movement to the movement of the bag.

19. A process of Claim 16 wherein a plurality of bags are moved down the first and second vats in sequence.

20. A process of Claim 16 for removing dye from fabric carrying said dye comprising the

steps of

- a) moving a bag containing said fabric down a first longitudinal vat containing a liquid solvent for said dye at a level wherein longitudinal movement of liquid in the vat is blocked by the bag, whereby longitudinal movement of the bag causes liquid solvent to flow through the bag in a direction counter to the movement of the bag;
- b) moving the bag from the vat across a drainage platform to allow excess liquid solvent to flow from the bag;
- c) moving said bag containing said fabric down a second longitudinal vat containing liquid solvent for the dye at a level wherein longitudinal movement of the bag causes liquid solvent to flow through the bag in a direction counter to the movement of the bag.

21. A process of Claim 16 for removing dye from fabric carrying said dye, wherein the dyed fabric is denim, and the liquid is a solvent for indigo.

22. A process of Claim 16 wherein solvent for the dye is passed from the second vat to the first vat in countercurrent movement to the movement of the bag.

23. A process of Claim 16 wherein a plurality of bags are moved down the first and second vats in sequence.

24. A process of Claim 16 for removing dye from fabric carrying said dye comprising the steps of

- a) moving a bag containing said fabric down a first longitudinal vat containing an aqueous solution containing a reducing and solubilizing agent for said dye at a level wherein longitudinal movement of liquid in the vat is blocked by the bag, whereby longitudinal movement of the bag causes said aqueous solution to flow through the bag in a direction counter to the movement of the bag;
- b) moving the bag from the vat across a drainage platform to allow excess aqueous solution to flow from the bag; and
- c) moving said bag containing said fabric down subsequent longitudinal vats containing aqueous solution for the dye at a level or levels wherein longitudinal movement of the bag causes said aqueous solution to flow through the bag in a direction counter to the movement of the bag.

25. A process of Claim 20 wherein a pump is used to recirculate process liquor through a portion of the trench and through any bags of fabric contained within said portion of trench.

26. A process of Claim 20 for removing dye from fabric carrying said dye wherein the dyed fabric is denim, and the aqueous solution contains a reducing and solubilizing agent for indigo.

27. A process of Claim 20 wherein aqueous solution containing a reducing and solubilizing agent for said dye is passed from the second vat to the first vat in countercurrent movement to the movement of the bag.

28. A process of Claim 20 wherein a plurality of bags are moved down the first and second vats in sequence.

29. A process of Claim 20 wherein the trench utilized for the reduction and extraction of dye is covered with an airtight cover which retains an inert gas or oxygen depleted gas environment above the trench and the bags.

30. A process of Claim 12 for bleaching fabric carrying said dye comprising the steps of
a) moving a bag containing said fabric down a first longitudinal vat containing an aqueous solution containing a bleaching agent for said dye at a level wherein longitudinal movement of liquid in the vat is blocked by the bag, whereby longitudinal movement of the bag causes said aqueous solution to flow through the bag in a direction counter to the movement of the bag;

b) moving the bag from the vat across a drainage platform to allow excess aqueous solution to flow from the bag; and

c) moving said bag containing said fabric down a second longitudinal vat containing aqueous solution for the dye at a level wherein longitudinal movement of the bag causes said aqueous solution to flow through the bag in a direction counter to the movement of the bag.

31. A process of Claim 30 for bleaching fabric carrying said dye wherein the dyed fabric is denim, and the aqueous solution contains a bleaching agent for indigo.

32. A process of Claim 30 wherein aqueous solution containing a bleaching agent for said dye is passed from the second vat to the first vat in countercurrent movement to the movement of the bag.

33. A process of Claim 30 wherein a plurality of bags are moved down the first and second vats in sequence.

34. A process of Claim 30 wherein the bleaching agent is hydrogen peroxide bleach containing a bleaching catalyst.

35. A process of Claim 34 wherein the bleaching catalyst is water soluble quaternary amine catalyst.

36. The process of claim 16 wherein dyes, chemicals and reagents that may assist in enabling optimization of the fabrics of this invention for utilization in subsequent processes or end use applications can be added.

37. The process of claim 36 wherein the treatments may contain humectants, antibacterial agents, lubricants, dyes or tints, optical brighteners, hand modifiers, antistatic agents and the like.